ABSTRACT

The invention is an agitated countercurrent flotation apparatus having a plurality of flotation cells through which a separable fluid mixture of solids or liquids or both flows sequentially. Preferably, each cell is provided with an upright shaft having a plurality of impellers attached to it and spaced along its length with disks being affixed to the shaft between adjacent impellers, thereby defining a plurality of flotation zones vertically within the cell. This structure enables the creation of a gradient of flotation conditions vertically within each cell so that conditions can be tailored to maximize the mass transfer of particles onto bubbles and promote a flow of liquids or solids laden bubbles upward through the cell and a countercurrent decreasing concentrated stream for the feed into the next cell. The separation efficiency of the flotation process provided by the apparatus is enhanced by providing each cell with an overflow launder into which a liquids or solids laden froth flows, and providing fluid communication means extending from the overflow launder of each downstream cell to an inlet of the previous upstream cell, thereby providing a recycling of floated material. The apparatus is particularly useful for the flotation of fine and ultrafine particles.